DESIGN AND DEVELOPMENT OF AN AUTOMATED BELLOWS (CARGO) POCKET AND FLAP SETTER FINAL REPORT

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The Georgia Institute of Technology Economic Development Institute in partnership with Durkopp Adler America Inc. of Atlanta endeavored to produce an automatic cargo (bellows) pocket setter system for the attachment of cargo pockets in the manufacture of the Battle Dress Uniform (BDU) ensemble.

The project was successful in developing the appropriate modification (style set) for the 805 automatic pocket attachment machine enabling it to attach the lower right and left cargo pockets of the BDU coat. The developments of this project are considered a success and are now commercially available. Durkopp Adler America is able to supply DOD contractors with a reliable pocket attachment machine for BDU coats.

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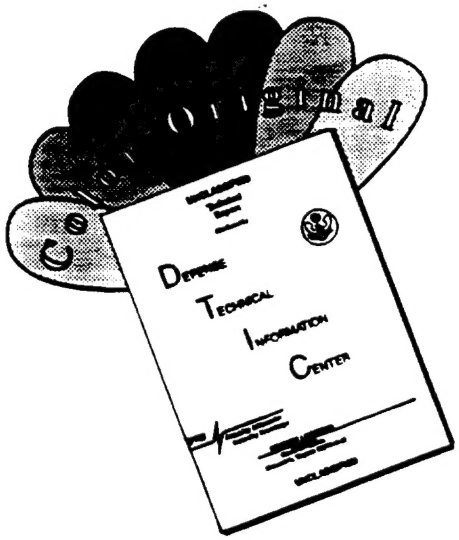

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Executive Summary

The Georgia Institute of Technology (Georgia Tech) Economic Development Institute in partnership with Durkopp Adler America Inc. (Durkopp) of Atlanta endeavored to produce an automatic cargo (bellows) pocket setter system for the attachment of cargo pockets in the manufacture of the Battle Dress Uniform (BDU) ensemble. The funding for this project included $118,740.06 from the U.S. Department of Defense (DOD) with $13,630 provided by the State of Georgia and numerous hours of technical support and shop/machining time contributed by Durkopp. Also, numerous hours of evaluation by Goodwill Industries of Atlanta, Goodwill Industries of South Florida, and Terry Manufacturing , Inc. were provided to adapt the machine design to a productive DOD contractor manufacturing environment.

The project endeavored to utilize as much commercially available equipment as practical to minimize technical risks and costs to perspective apparel manufacturers.

Durkopp was solicited by Georgia Tech to be a partner in this project for numerous reasons with the primary one being the flexibility of the robotic Model 805-11103 Jeans weight fabric Pocket Attachment System marketed by the company. Also, Durkopp offers an attachment for the machine enabling it to set the pocket flap in conjunction with the pocket.

The project was successful in developing the appropriate modification (style set) for the 805 automatic pocket attachment machine enabling it to attach the lower right and left cargo pockets of the BDU coat. The project was unsuccessful in modifying (enlarging) the sew field necessary to enable trouser cargo pocket attachment. However, there seems to be a trend of equipment manufacturers to enlarge pocket attachment sew fields. Thus, growing market pressure may prompt manufacturers to soon offer a pocket setter suitable for DOD applications. Also, current trends toward automatic loading of sewing machines may some day enable automatic pocket setters to operate completely without attendants having to load and initiate clamping of individual pocket panels as currently required. This innovation will greatly benefit the investment economics.

A slight modification to the pocket pattern is required to enable the application of automation for cargo pocket attachment. The modification has been reviewed by Army Natic and the Defense Personnel Support Center (DPSC) Industry BDU Committee and found to be acceptable.

Because of the extremely limited availability of 805 Pocket Attachment Machines (demand has outstripped production) at this time, a loaner machine for the project team to produce a documentary video and conduct demonstrations has not been possible. Georgia

Tech will endeavor to purchase a machine to guarantee exclusive availability. As an alternative, the team is endeavoring to interest a military contractor in purchasing a machine for demonstration purposes. Also, this report will be sent to DOD contractors currently producing BDU items to publicize the results.

The developments of this project are considered a success and are now commercially available. Durkopp Adler America is able to supply DOD contractors with a reliable pocket attachment machine for BDU coats.

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1.0 INTRODUCTION

Several of the Department of Defense (DOD) clothing items, such as Battle Dress Uniform (BDU) trousers and coats, are steady consumption items (almost 2 million units per year) that conform well to standard production line methods. But, production volumes are small in the view of sewing equipment manufacturers. Little incentive exists for equipment manufacturers to develop sewing machinery specific and unique to the industry. The only automated equipment found are items that have wide application for commercial products. Because military items are specialized in material and assembly, few civilian (commercial) substitutes are available.

Automated equipment for producing these military apparel items is attractive from the standpoint of the DOD contract manufacturer. Volumes of production and moderate changes in style/construction in comparison to commercial apparel items can justify investments in automation.

This research and development effort endeavored to automate one of the most labor intensive and costly assembly steps - attaching (setting) bellows cargo pockets. The goal of the project was to overcome the development cost and uncertainty hurdle which is limiting automated pocket setter manufacturers from developing equipment specifically for DOD apparel manufacturers.

2.0 BACKGROUND AND PROJECT GOALS

Attaching the two bellows pockets and associated cover flaps, located at the waist and breast of the Battle Dress Uniform (BDU) coat and on the outseams of the trouser, requires complex and time consuming work from a highly skilled sewing operator. The same pocket design is incorporated on a number of other DOD garments. The typical pocket attachment time of 3.6 minutes per coat (41 minute total assembly standard allowed minutes typical for coat assembly) and almost to two minutes per trouser represents one of the most complex and time consuming assembly operations of the garment. This project endeavored to cost effectively automate the process using existing technology with suitable modifications to minimize project risks and to maximize ease in implementation. This project considered the employment of a traditional automated patch pocket setter with suitable modifications. The endeavor demonstrates the viability of reducing attachment time by more than one half.

Unfortunately, this cargo pocket design is not prevalent on civilian garments. Thus, sewing equipment manufacturers had little incentive to make the necessary developments for military apparel because of the lack of mastery in government specifications, unique contractor requirements, and the small market potential. The project team has endeavored to bridge this barrier by offering a system approach that will accommodate a large number of bellows pocket designs. Successful implementation of the project results will reduce the direct labor component of BDU manufacturing by more than 2.6 percent, equaling $1.9 million in savings for BDU coats alone.

2.1 Bellows (CARGO) Pocket/Flap Setting for DOD Apparel, Background

From the perspective of the Department of Defense (DOD), the concepts and techniques herein may assume increased importance, especially in the event of rapid mobilization such as witnessed during the Desert Shield/Storm operation. At that time over 4.2 million BDU ensembles were produced. DOD needs to develop, nurture, and maintain a stable and steady base of suppliers who will adopt automated sewing techniques and strive toward implementation of advanced manufacturing technologies. The successful implementation of an Automated Bellows(Cargo) Pocket and Flap Setter is important, as this may be the first significant step in sewing automation for many DOD contractor facilities. This development may lead to widespread implementation of other promising apparel assembly technologies, which could benefit the DOD contractor apparel sector that has previously been notorious for its lack of commitment to advanced assembly/ manufacturing techniques. To address this problem the U.S. Defense Logistics Agency (DLA) has recently funded the establishment of two advanced apparel manufacturing technology demonstration centers and a large network of research operations (Apparel Research Network) to foster the development and assimilation of advanced manufacturing techniques at DOD apparel plants.

2.2 Project Goals and Project Benefits

This effort endeavored to develop, test, and document the viability of automated pocket/flap setting (attachment) using a programmable pocket attachment machine. This development is attractive from an economic view and it also offers the following additional opportunities to the manufacturer:

- De-skill the pocket/flap set operation, making staffing easier.
- Allow handicapped/physically challenged persons to perform the operation, broadening the work force applicant pool.
- Reduce training time and associated plant overhead.
- Enable the manufacturer to invest in a machine with multiple task capability as commercial programmable pocket setters can be rapidly reconfigured for other products.
- Automated pocket setting consistently produces and documents good quality assemblies reducing the need for finished goods inspection.
- Will pioneer computer integrated manufacturing in many contractor facilities.
- Current pocket setters only set (attach) unfolded/flat pieces with no pleats. This project enlightens the sewing equipment industry to a broader application of the technology.
- Broad market penetration of pocket setters may be achieved by expanding the role of the machine to attach seat, elbow, and knee patches on BDUs.
- Because the technology is developed in concert with a prominent sewing machine manufacturer, commercial availability of this technology is virtually guaranteed.

2.3 Anticipated Economic Factors

2.3.1 Anticipated Benefits to the Contractor:

Exhibit 2.3.1 shows estimated annual savings proposed for this project to be in excess of $3.8 million per year for BDU coats alone. For contractors who maintain large in-process inventories, multi-shift operations may be a viable option for machine stations not

Preliminary Savings Design Criteria:

- Programmable pocket setter machine will set pockets and flaps in one minute, reducing time from two minutes. Savings are estimated at one standard allowed minute (SAM) per coat.
- Assume a base rate on a high skilled operator is $7.00 per hour and $6.00 per hour on a low skilled operator.
- Excess cost is 15%.
- Fringe benefits are 30%.
- One programmable machine projected to sew 480 units per day.

Hence:

2 SAMs(Manual Sewing) x $7.00/60 min	= $0.233/unit
1 SAM(Auto attachment) x $6.00/60 min	= $0.100/unit
Net savings	= $0.133/unit
Direct labor savings to contractor	= $0.133/unit
Times excess cost	x 1.15
Standard direct labor savings to contractor	= $0.153/unit
Savings times operator fringe benefits	x 1.30
Total estimated direct labor savings	= $0.199/unit
Total units produced: 480 units x 250 days/year	= 120,000/year
Annual Estimated Savings (One Shift/Day): 120,000 units/year x $0.199/unit	= $23,900/yr
Annual Estimated Savings (Two Shifts/Day): 240,000 units/year x $0.199/unit	= $47,800/yr
1992-Estimated Cost of Machine:	$85,000
Simple Payback: Cost/Savings) = $85,000/$47,800/year	= 1.78 Years

(Maintenance, power, absenteeism, off standard production, etc. is assumed to be off-setting in this comparison).

Anticipated Benefits to the DOD Contractor
Exhibit 2.3.1

requiring extensive sewing skills thus making the investment payback for the equipment more attractive. This strategy for two shift operations was projected to offer a simple payback of only 1.8 years. As the cost of sewing technology continues to decrease and competition in the equipment market continues to increase, the investment payback for the system may fall below one year. Also, non-traditional economic benefits not documented in Exhibit 2.3.1 will result from:

- Improved quality.
- Fewer rejects/Less rework.
- Much lower training cost.
- Higher productivity via;
  - Use of less skilled operators (conversely this enables the plant to use its skilled operators at stations that do not readily accommodate automation).
  - Better competitive position for plant through improved quality.

The technology is likely to be the first application of programmable sewing technology for the BDU manufacturer. The successful implementation will facilitate a path for other applications of advanced sewing technology.

2.3.2 Anticipated Benefits to U.S. Government/DOD:

Exhibit 2.3.2 projected estimated benefits to DOD to be approximately $0.46 per BDU coat, which is approximately $7.7 million per year considering an equal amount of BDU trousers. This is assuming the contractor passes the savings on to DOD by lowering bid prices. However, we would first expect the contractor to pay for the equipment out of the savings.

Contractor reduced costs		
Standard Direct Labor Savings		= $0.153/unit
Common multiplier used by contractors to cover excess cost, fringe benefits, overhead and profit: 3x		= $0.459/unit
Estimated Annual U.S. Procurement of BDUs:		
Bottoms		4,200,000
Tops		4,200,000
	Total	8,400,000 units/year
Total Estimated Potential Benefits to Government for BDU coats only:		$3,860,00.00/year

Automatic Cargo (Bellows) Pocket Setter System
Anticipated Benefits to the U.S. Government
Exhibit 2.3.2

3.0 STATEMENT OF WORK AND PROJECT APPROACH

3.1 Applicable Definitions

3.1.1 Bellows (Cargo) Pocket and Flap - A patch type pocket with pleats (for expendability) designed for large capacity and cover flap. The cargo pocket incorporates a separately attached cover flap to keep dirt out and contents in.

3.1.2 Automated (and/or Programmable) Bellows Pocket/Flap Setter - Commercially available programmable patch pocket setting (attachment) machine, complete with specialized clamps and programming to attach the DOD specification BDU bellows pocket and cover flap. Improved productivity, uniformity and quality are usually associated with programmable sewing.

3.13 Bellows Pocket Attachment - The act of sewing the pocket panel to the garment. In the industry, this is typically called "setting" the pocket. Note, usually the pocket panels have some amount of initial work performed on them. For this project the pocket panels have had the top and bellow hem installed and a tack to reliably establish the location of the lower tack (bellow side).

3.14 Bellows Pocket Test Coupons - Cargo pockets attached (sewn) to fabric panels during the testing phase of the project to evaluate the attachment process of machine hardware and programming for conformance to military specifications and suitability by contractors.

3.2 Applicable Specifications - Items employing bellows pockets which are the focus of this study

Trousers, Camouflage pattern, Combat , MIL -T 44047 D
Coats, Camouflage pattern, Combat , MIL -T 44048 F

3.3 Government Furnished Materials

For the purposes of this project no materials and equipment were supplied by the government. Georgia Tech, Southern Tech and the State of Georgia with its partner, Durkopp provided all materials, equipment, software, shop time and facilities required to perform on this project. Additional technical support was provided by BDU producers.

3.4 Project Approach and Work Scope

The DESIGN AND DEVELOPMENT OF AN AUTOMATED BELLOWS (CARGO) POCKET AND FLAP SETTER as proposed by Georgia Tech in concert with in-kind support of Durkopp Adler and financial cost-sharing from the State of Georgia endeavored to perform the following tasks:

(1) Develop Performance Specifications: The project team prescribed specifications relative to performance of the machine including:

- Cycle time
- Ease of loading and unloading
- Quality of output
- Accuracy
- Daily Production Requirements
- Cost of machine
- Economic Performance
- Ergonomic Requirements

(2) Design Clamps: Conduct a preliminary design of the system, with final design performed by the selected participating sewing machine manufacturer Durkopp Adler America, Inc.). Clamps were to be designed to properly fold edges and hold the pocket and flap during stitching without the aid or direction by a skilled sewing operator. Sketches were to be provided to Durkopp Adler, Inc. for the purpose of designing clamp design and construction. Sample pockets and flaps were to be provided by existing BDU manufacturers for testing during construction.

(3) Build Clamps/Program Sewer: The project team was expected to work closely with the sewing equipment manufacturer during clamp construction to assure conformance to military specifications and project goals.

(4) Laboratory Test Equipment: The prototype machine was to be tested to verify consistency, performance, ergonomics, and ease of operation in Durkopp Adler's design/fab/test center using mil-spec panels and thread. Test coupons were to be evaluated for acceptability by existing BDU manufacturers.

(5) Demonstrate System at AMTC and a Contractor Facility: The system was to be demonstrated along with the Georgia Tech and Southern Tech Apparel Manufacturing Technology Center 's (AMTC) regular manufacturing demonstration activities. Also, a contractor facility (Terry Manufacturing, Inc. Roanoke Alabama) was arranged to host an automated cargo pocket attachment unit for durability testing.

(6) Document/Disseminate Results: A video tape documentation of the project results was to be prepared for dissemination to current and future DOD contractors. Savings potential estimates (both traditional and non-traditional) were planned to be prepared and made available to government contractors.

4.0 PROJECT RESULTS

4.1 Develop General Performance Specifications

Georgia Tech developed the performance machine specifications for the Durkopp 805 pocket setter machine including:

1) Cycle time: Pocket attachment time must be accomplished in half the standard allowable time. Excess costs, downtime, maintenance costs, etc. are expected to remain the same as manual pocket setting.

2) Ease of loading and unloading: Operation of the machine is expected to only require entry level personnel. Actual machine training is specified to require one day on-the-job training and one week to operate at standard time. Significant time may be required for plant maintenance staff training if they are to conduct major maintenance functions on the equipment. For the purposes of this endeavor, the project assumed the plant would operate with a maintenance agreement so major maintenance is provided by outside services.

4) Quality of output: Operation is expected to copy historical data for the pocket attachment machines. Rejects upon proper machine maintenance are expected to result in a 0.001 reject rate. Manual pocket attachment operations typically operate at a 0.04 reject rate.

5) Daily Production Requirements: Original machine production was estimated at 480 units per shift. This has been revised down to 417 units per shift. Also, machine availability is revised down to a maximum of two shifts per day instead of three. The third shift is reserved for any maintenance or adjustments required.

6) Cost of machine: Machine costs has been declining at a rate of about four percent as equipment production volume increases and initial development costs have been absorbed. Note, the number of features and accessories have increased.

7) Economic Performance: Although not quantified, ergonomic problems associated with repetitive motion disorders is expected to decrease substantially. With the automatic attachment machine requiring less operator skill, a larger population of employees are available to operate the machine. Thus, frequent job changes and operator substitutions enable more job variety. Also, the extreme bends of the wrists associated with pocket attachment sewing are eliminated as loading the

automatic attachment machine is accomplished with more elbow and shoulder motion.

8) Operational Requirements: Best machine performance is achieved with the operator in the standing position. Two hands are required. Also, due to the extended sewing cycle, an operator can easily operate two machines simultaneously. Larger facilities will want to dedicate one machine for left pockets and the other for right ones. Accommodating disabled operators is expected to be limited to the wheelchair bound and the mentally challenged. Voice activation may provide a wider opportunity to accommodate disabled individuals.

Specifications development for the pocket clamp were made in earnest. Some changes were integrated due to the differences in attaching the right and left pockets. Generally, both right and left pockets are attached by the same sewing head as there is not a right and left sewing head. Thus, the right pocket is sewn in the reverse direction to that of that of the left. See pocket coupon photos in Appendix III. This difference poses a challenge as pocket setter machines are traditionally setup to only sew right or left pockets within a single style set (machine software and clamp). On the BDU coat the right and left pocket seaming is rectangular and mirror images (symmetrical around vertical axis) so there are no clamp (hardware) differences.

However, difficulty arises in installing the lower bellow-side back tack. In hand sewing, the right and left pocket attachment operations are different enough due to back tack installation procedure to have different Standard Allowable Minutes specifications and methods. See Appendix III. for the location of the back tack.

For BDU manufacturing applications, having right *and* left pocket set capability on the same machine is desirable for the line balancing requirements. This is particularly necessary in small plants where the setter machine is expected to make the greatest penetration and benefit to DOD. In BDU plants only a small number of machines (typically two) will be operated, thus it is necessary to have right/left pocket attachment flexibility in the event one machine is down for repairs.

Breast pockets of the BDU coat were not studied because ARMY Natic suggested we postpone work on these since this pocket was undergoing design changes to accommodate a pocket computer. Upon, finalizing pocket geometry, it will be simple to design a sewing guide to enable automated pocket setting as with the waist pockets.

4.2 Design Clamps

Preliminary design was performed by the project team, with final design performed by Durkopp Adler America. The clamp sewing guide was developed for the BDU coat lower

(waist) pockets. The initial plan was to develop the attachment system for the trouser cargo pockets, also. This was abandoned after an unsuccessful effort to enlarge the sewing field of the 805 pocket attachment machine. Durkopp has an in-house project for this at their shop in Germany, thus it was decided to allow time and Durkopp's in-house efforts to develop a large enough sew field for the trouser. Upon this development coming to market, the DOD BDU industry should investigate the use of the machine to attach seat, knee, and elbow patches as this would also be an attractive method to automate these operations.

It is not known if any pocket setter is currently on the market that can accommodate a pocket the size of the trouser cargo pocket. At the time of the investigation, none were found. Upon abandoning the trouser cargo pocket, the coat waste pocket was considered and found acceptable as a substitute for the endeavor. The experience gleaned from the project would be directly applicable to the trouser.

The clamps and sewing guide were designed to properly fold edges and hold the pocket during stitching. The pocket flap clamp required no development beyond the commercial model as the pocket flap is pre-manufactured prior to the pocket attachment operation with no special folding or handling before attachment. Because, the right and lift pockets are symmetrical around the vertical axis, the hardware for both the right and left pocket is the same. Appendix II shows the drawings used by Durkopp to build the pocket clamp assembly. In association with the hardware, a Durkopp Adler Model 805 - 11103 Pocket Attachment machine was programmed to accomplish the sewing operation. This is the heavy fabric (Jeans) machine design which was believed to be necessary for cotton content desert BDU fabric. However, for factories that manufacture the other types of BDU only, Durkopp's shirt-weight fabric pocket setter make prove adequate at substantial savings in equipment cost.

A slight modification to the pocket pattern was required to enable the application of automation for cargo pocket attachment. The use of an automated pocket setter requires the pocket to be a rectangular shape. DOD cargo pockets incorporate a slight taper at the top (~0.35") to assure the pocket flap completely covers the pocket for the range of attachment tolerances. See Appendix I for differences noted in the patterns. Concern was raised about our requirements of removing the slight taper from the top of the pocket to

accommodate automation. According to Army Natic, removing the taper is reported to be acceptable. We also pursued this with the Industry BDU Committee headed (at that time) by Mr. Roy Terry of Terry Manufacturing , Inc. He obtained a waver for his coat contract for this under the expectation that the esthetic qualities (that the flap would cover the entire pocket opening) would remain. By attaching the flap in concert with the pocket via an automated pocket setter, no taper is needed as the flap is set with far greater precision.

To limit the complexity of the clamp system, one step of was added to pocket panel hemming to prepare the pocket panel for automated attachment. By a Durkopp recommendation, the back tack located on the lower (bellow side) edge of the pocket would incorporate a hold stitch for reliable loading of the pocket panel into the setter. See Photo 2. In Appendix III. This was necessary to assure proper location of the tack as the dimensional variability of the pocket panels gave the machine no reliable place from which to measure and locate the tack. Upon measuring this at Terry Manufacturing, Inc. we found pocket cut variations as much as one half inch due to hand cutting. Our own experience indicates a similar level of variation in robot knife cutting very high plies. Adding the tack step was investigated at Terry Manufacturing, Inc. to indicate how costly this would be the project economics. Roy Terry and his staff said they would have to budget 0.1 SAM to the bellow hemming operation (prior to pocket attachment) to add the stitch.

4.3 Build Clamps/Program Pocket Setter

The prototype style set (hardware guides and programming) was constructed by Durkopp and incorporated on a borrowed 805 machine. This work was performed by Durkopp technicians at their main (domestic) shop in Atlanta.

4.4 Laboratory Test Equipment:

Test coupons for pocket attachment was made using the Model 805 - 11103 Pocket Attachment machine. Coupons were presented to Mr. Roy Terry and staff of Terry Manufacturing, Inc. The strategy here was to get the machine to meet the approval of Terry Manufacturing, Inc. where the production demonstration is planned.

4.5 Demonstrate System at AMTC and at a Contractor Facility:

The pocket attachment system is planned to be demonstrated at the DOD contractor facility, Terry Manufacturing, Inc. This is planned to occur when an 805 pocket attachment machine is available to be borrowed. This step will enable the project team to conduct operational demonstrations to the industry at large and to evaluate the system durability, consistency and ergonomic impacts. Note, Durkopp does not believe this step

is necessary because their operational experience indicates the machine is ready for commercial distribution.

Georgia Tech's Apparel Manufacturing Technology Center was dismantled before the project completion which precluded the demonstration of the machine as part of regular manufacturing demonstrations. Because the demonstration phase has been delayed due to

the availability of an 805 machine, a condensed version of this report will be circulated to the contractor base. Also, the project team will endeavor to purchase a machine to guarantee unlimited access in the event work is furthered in this area.

4.6 Document/Disseminate Results

Video tape documentation of the project results is planned for dissemination to current and future DOD contractors. Completion of the video is held until a machine is made available for in-plant demonstrations. However, with laboratory performance data on hand, we can project potential savings for the application of the machine by government contractors. Note, Durkopp Adler America, Inc. now considers the system commercially available and no further testing is required. It is expected the machine will be actively marketed to DOD contractors.

Updating the proposed benefits tables detailed in Section 2.3 is offered. Using updated information from contractor input and preliminary results from machine testing, economic performance is depicted in Tables 4.6.1 and 4.6.2.

Projected Savings Calculation Criteria:

- Programmable pocket attachment machine will set pockets and flaps in one minute, reducing time from two minutes. Savings are estimated at one standard allowed minute (SAM) per coat for waist pockets.
- Assume a base rate on a high skilled operator is $7.80 per hour and $4.75 per hour on a low skilled operator.
- Excess cost is 15%.
- Fringe benefits are 30%.
- One programmable machine will sew 417 units per day.

Hence:

2 SAMs (Manual sewing) x $7.80/60 min	= $0.260/unit
1 SAM (Auto attachment) x $4.75/60 min	= $0.079/unit
Net Savings	= $0.181/unit
Direct labor savings to contractor	= $0.181/unit
Times excess cost	x 1.15
Standard direct labor savings to contractor	= $0.208/unit
Savings times operator fringe benefits	x 1.30
Total estimated direct labor savings	= $0.270/unit
Total units produced: 417 units x 250 days/year	= 104,250units/year
Annual Estimated Savings (One shift/Day): 104,250units/year x $0.270/unit	= $28,200/yr
Annual Estimated Savings (Two shifts/Day): 208,500units/year x $0.270/unit	= $56,300/yr
1995-Estimated Cost of Machine:	$72,000
Simple Payback: Cost/Savings = $72,000/$56,200/yr	= 1.28 Years

(Maintenance, power, absenteeism, off standard production is assumed to be off-setting in this comparison).

Automatic Cargo (Bellows) Pocket Setter System
Contractor Benefits
Exhibit 4.6.1

Savings to Contractor		
Standard Direct Labor Savings		= $0.208/unit
Common multiplier used by contractors to cover excess cost, fringe benefits, overhead and profit: 3x		= $0.624/unit
Estimated Annual U.S. Procurement of BDUs		
Bottoms		1,800,000
Tops		1,800,000
	Total	3,600,000 units/year
Total Estimated Potential Benefits to Government for BDUs only		$2,250,000/year

Automatic Cargo (Bellows) Pocket Setter System
Projected U.S. Government Benefits
Exhibit 4.6.2

5.0 COST SHARE TO THE PROJECT

The funding for this project included $118,740.06 from the U.S. Department of Defense (DOD) with $13,630 provided by the State of Georgia for equipment and numerous hours of technical support and shop/machining time contributed by Durkopp. Also, numerous hours of evaluation by Goodwill Industries of Atlanta, Goodwill Industries of South Florida, and Terry Manufacturing , Inc. were provided as input to enable machine design to be attractive to the DOD contractor manufacturing environment. The project is indebted to these for their invaluable contributions.

6.0 LESSONS LEARNED AND RECOMMENDATIONS FOR FURTHER WORK

Based on the experiences of this project, several lessons have been learned that may bare opportunities and insights for future project work in the area of equipment development for DOD contractors. Highlights are:

1) Equipment (pocket attachment machine) availability has been an ongoing problem for the project team for a similar reason there is limited equipment available for DOD contractors. Since, this market segment is small from the perspective of equipment vendors, loaning their commercially available equipment for development purposes is unreliable. There seems to not be justification for losing an equipment sale for the sake using the equipment for developing a market with DOD contractors. This is in contrast to the bounty of equipment loaned to apparel manufacturing demonstration centers (where modifications to the equipment is limited and the market for the equipment is much broader than just DOD contractors). Thus, future equipment development projects will be far more able to maintain a reasonable development schedule if the equipment subject to the research is owned by the research team or is set aside strictly for the purposes of the project Also, using vendor in-kind technical support is as unreliable as is borrowed equipment. Hardware work should be accomplished using in-house technical staffing.

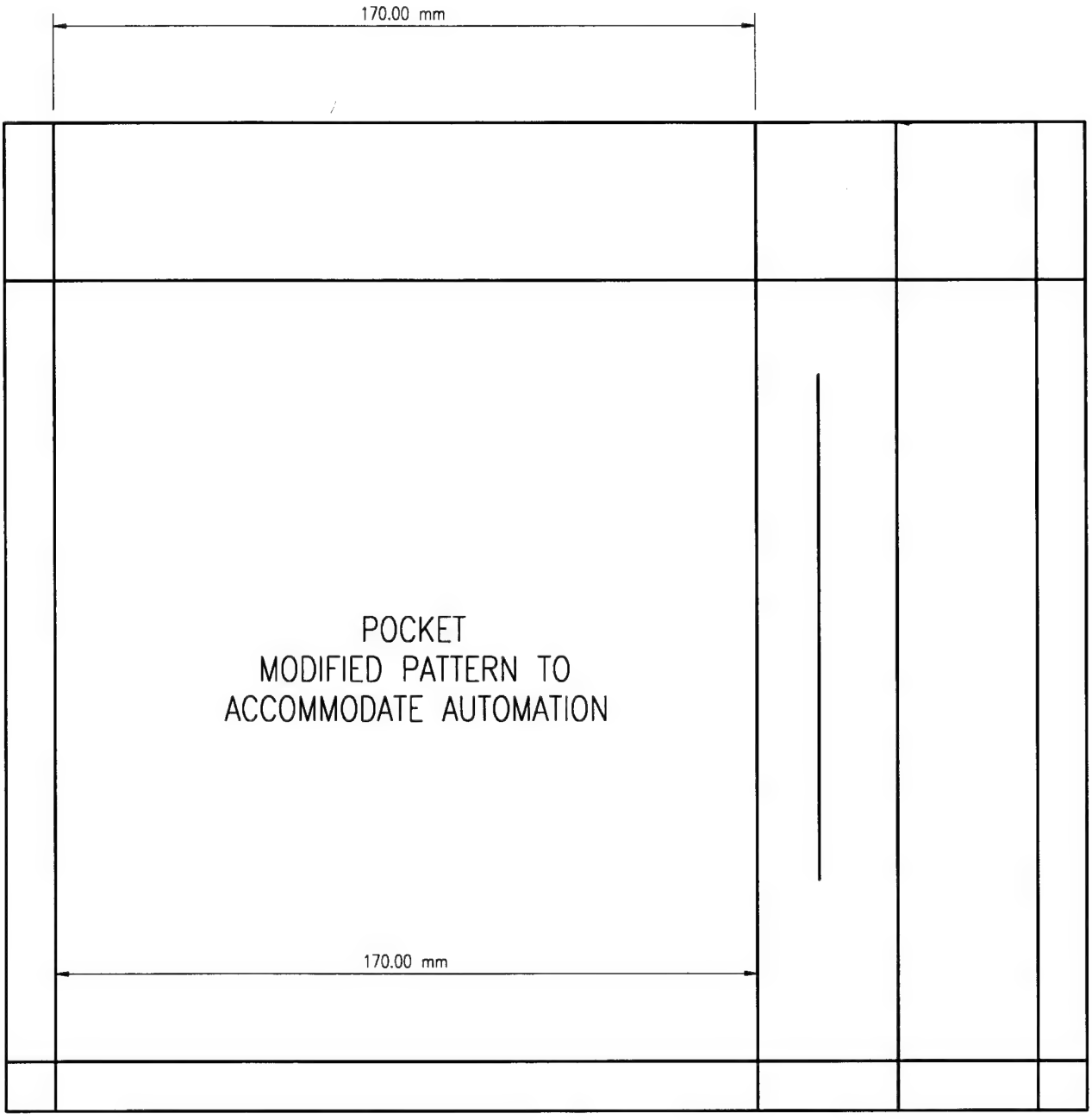
2) This work should be continued because of the low technical risks associated with applications of programmable sewing and the potential for so many DOD apparel attachment operations. Some operations aside from cargo pockets include labels, garment reinforcement patches (knee, elbow, seat), hems (double needle/double fell), pocket wells, webbing attachments, and waist band attachment.

3) Special attention should be given to battle dress and work apparel. Even though these items have a lower unit cost, consumption is large and style changes are minimal - characteristics that lend well to assembly line automation. Also, many of the dress apparel items have close civilian counterparts so government sponsored research should not be necessary in these venues.

APPENDICIES

APPENDIX I.

CARGO POCKET PANEL VIEW AND PATTERNS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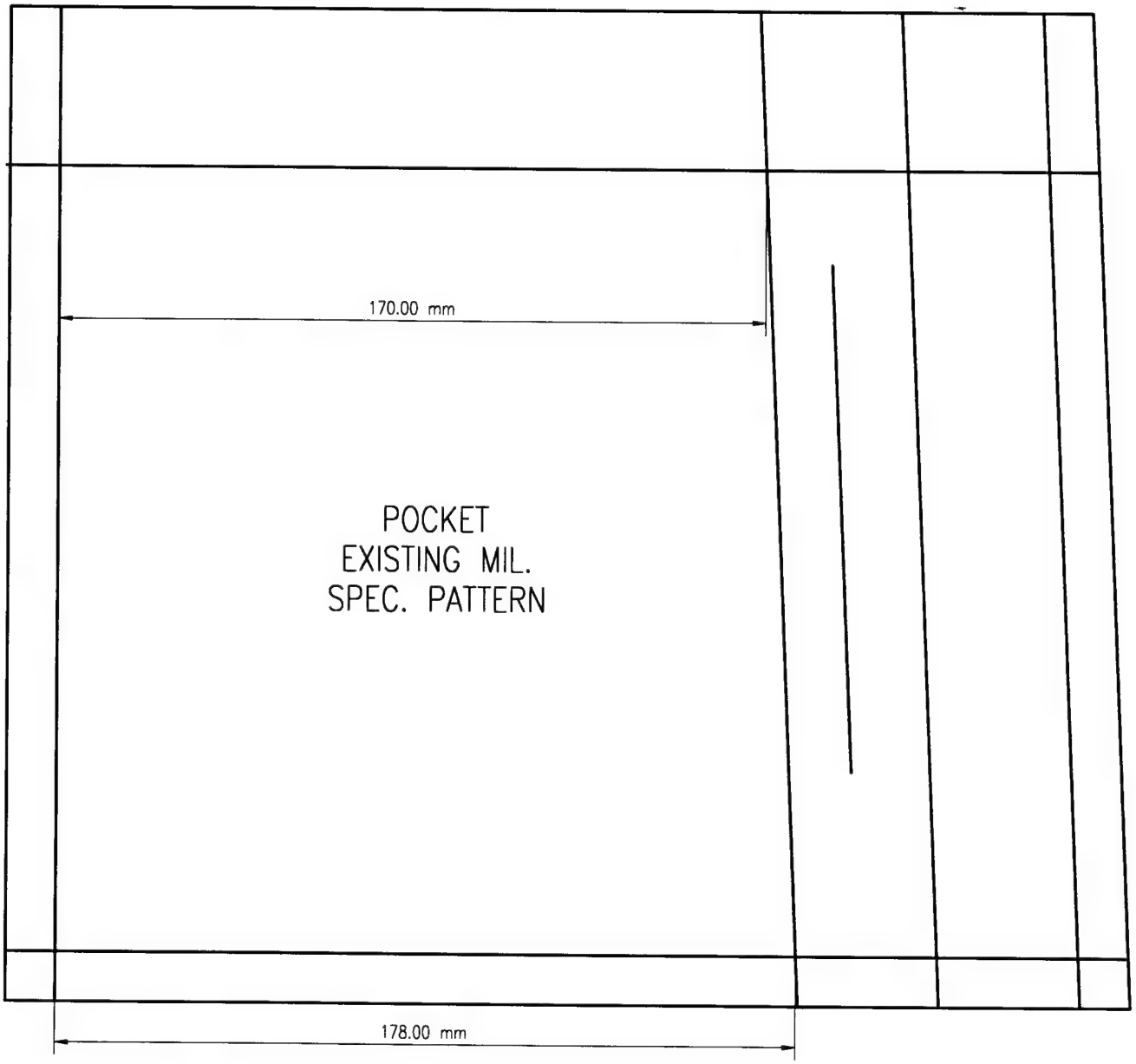

Georgia Tech

ECONOMIC DEVELOPMENT INSTITUTE
CENTER FOR PROCESS OPTIMIZATION

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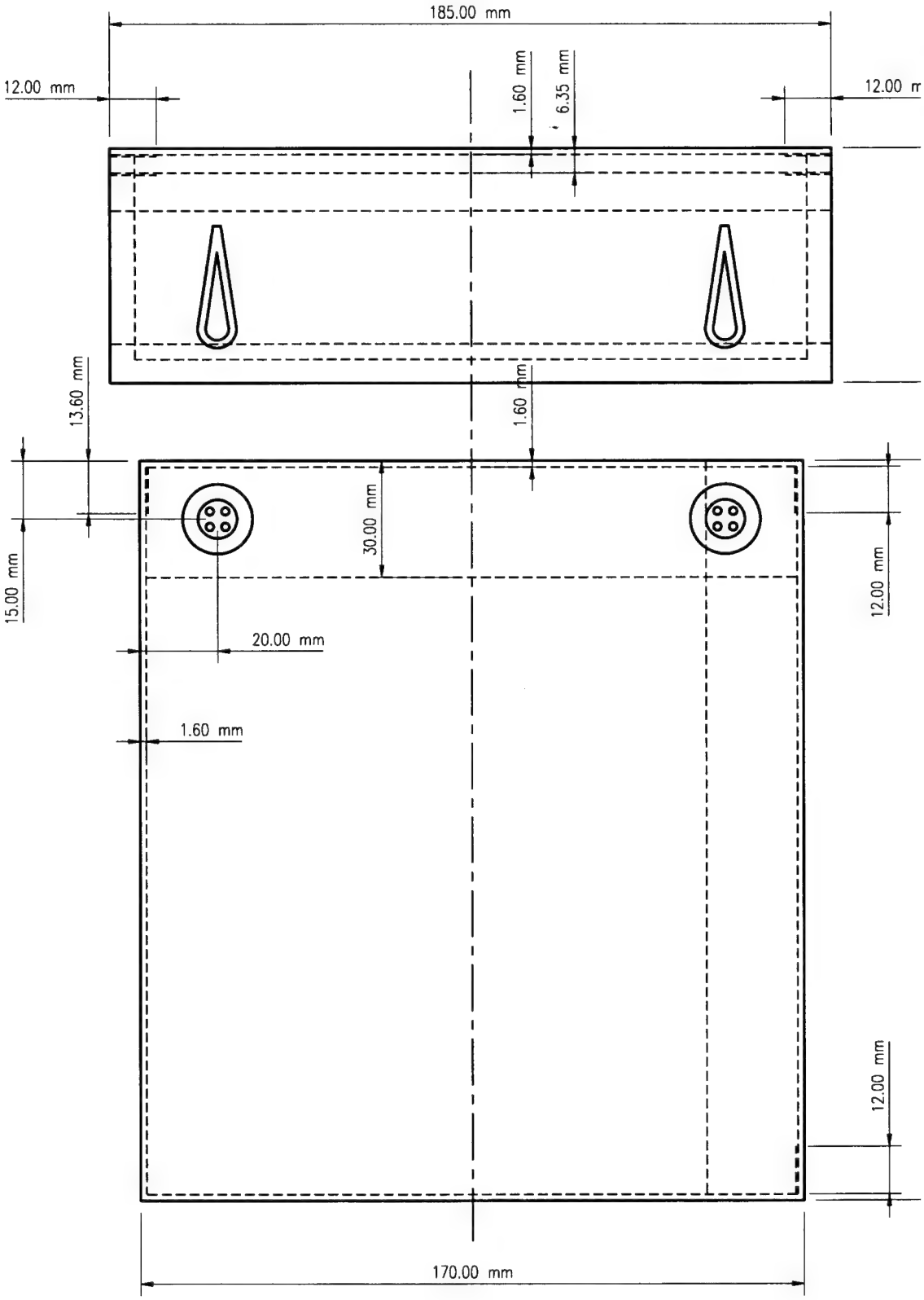
DATE: 12-19-95			LEFT POCKET PATTERNS	
APPROVED:			CUST.: DEFENSE LOGISTICS AGENCY	
SCALE: N.T.S.				
BUILD	BID	READ	PROJECT: L-31-606	DRAWING NO.: 02 / REV.: 0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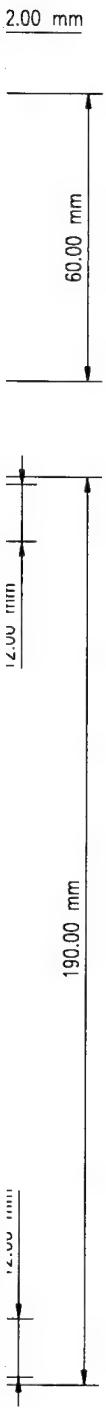
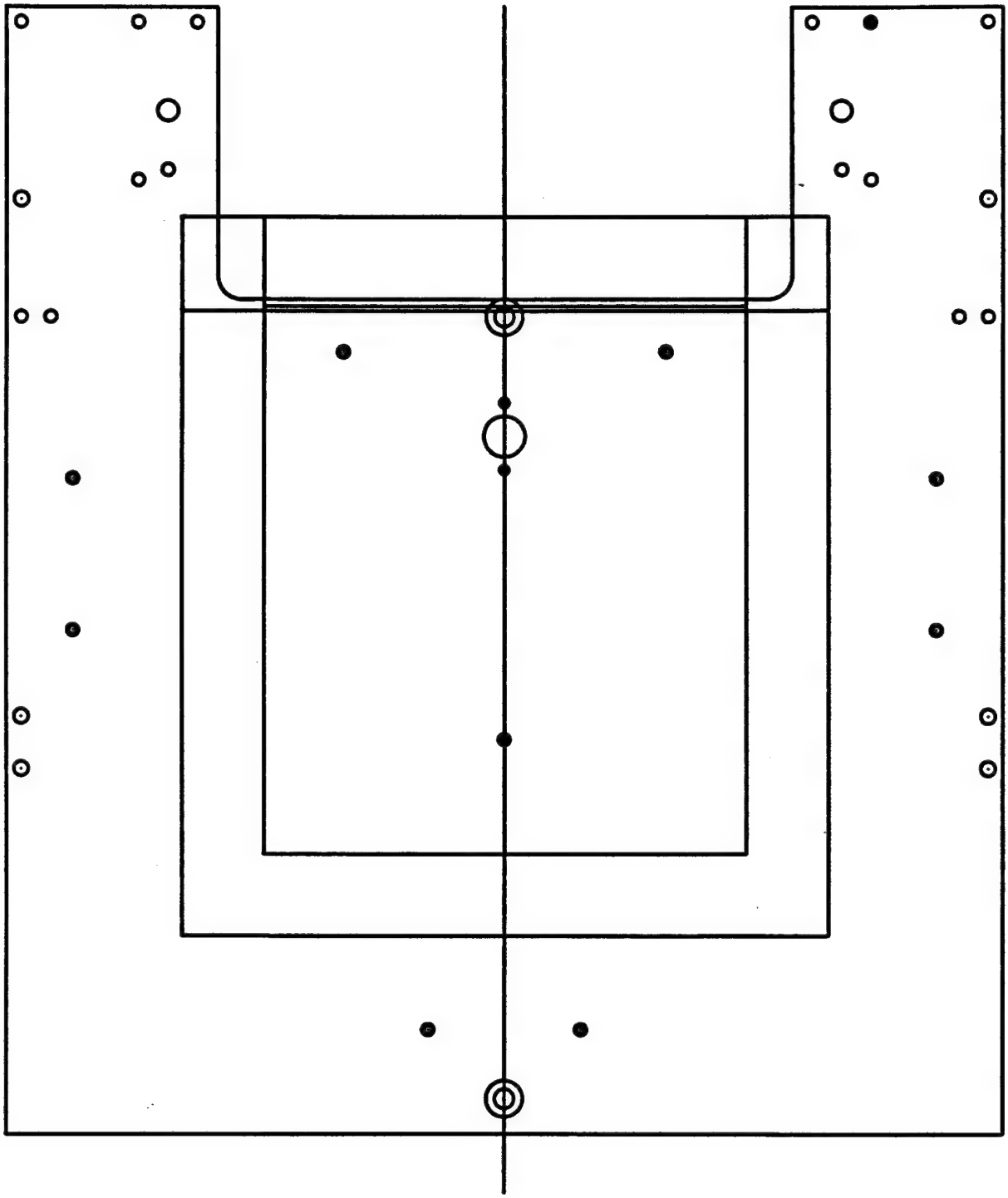
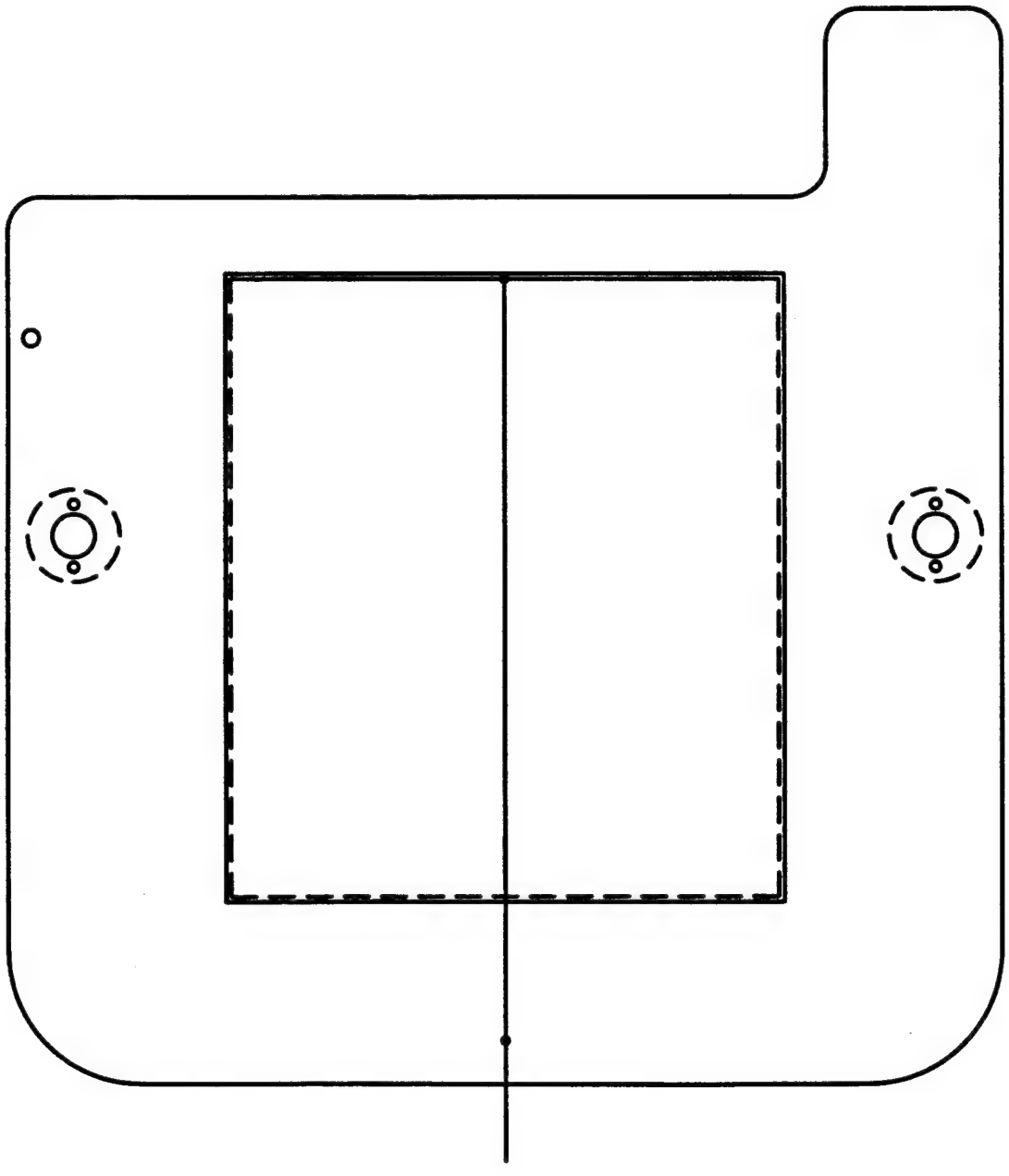


Georgia Tech ECONOMIC DEVELOPMENT INSTITUTE CENTER FOR PROCESS OPTIMIZATION	DRAWN SOM			TITLE WOODLAND CAMOUFLAGE JACKET BOTTOM	
	DATE 12-19-95			LEFT POCKET SHOWN AS ATTACHED	
	APPROVED			CUST. DEFENSE LOGISTICS AGENCY	
	SCALE N.T.S.				
	BUILD	BID	READ	PROJECT L-31-606	DRAWING NO. 01 REV. 0

APPENDIX II.

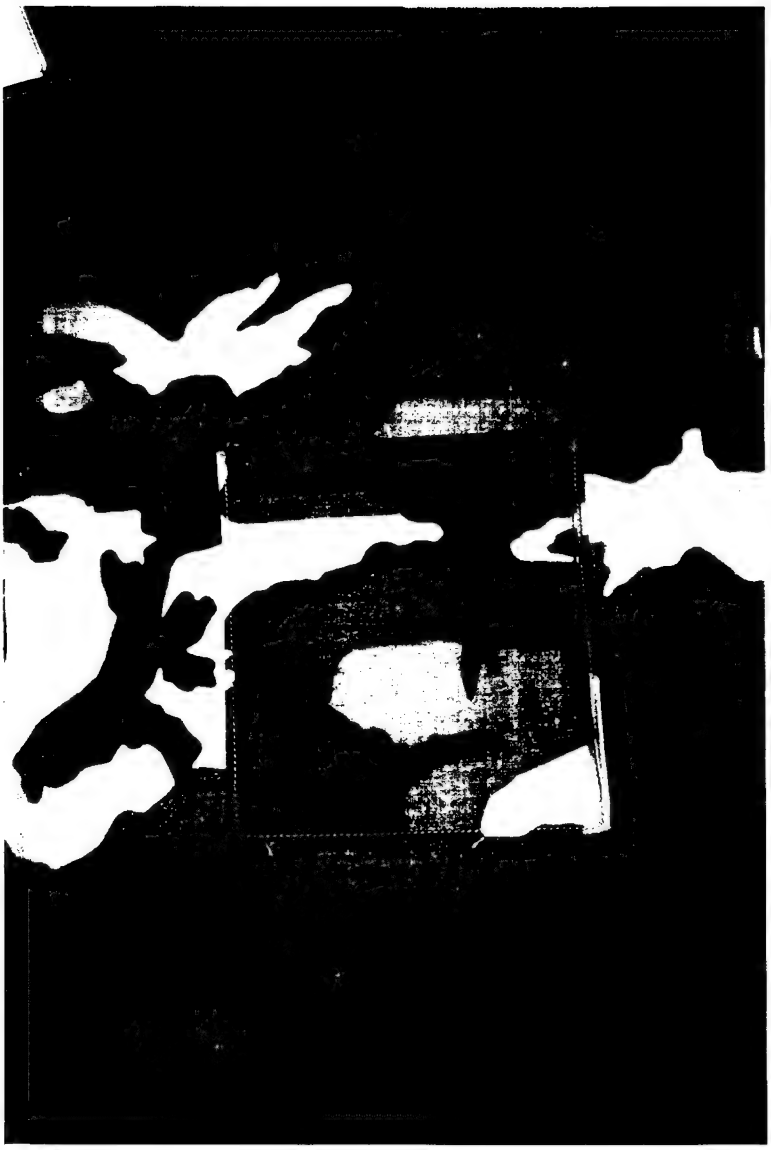
CARGO POCKET SETTER SEWING GUIDE DIE DRAWINGS





APPENDIX III.

PHOTOS OF SET POCKET COUPON



Photograph 1.
This photograph shows the BDU bellows pocket attached to a front coat panel. Light colored thread is used to make the seaming more visible in the photo.

Photograph 2.
This photograph shows the general position of the cargo pocket panel during the pocket attachment process. To maintain a high level of consistency in properly installing the back tack on the lower right corner (adjacent to the bellow pleat), a two or three stitch hold down is needed to stabilize the bellow.

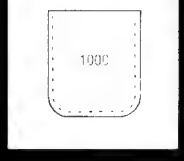
Simply by modifying the pocket attachment machine software, we can switch from the right pocket attachment operation to the left. The switch requires about 15 seconds.

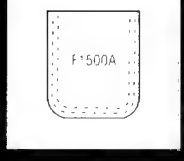
Photograph 3.
Continuing from photograph 2. The installation of the hold down tack would be installed during the pocket bellow hemming operation. This preparatory step negatively impacts project SAMs by about 10 percent.

APPENDIX IV.

TECHNICAL INFORMATION ON THE DURKOPP 805 POCKET SETTER SYSTEM

Computer- gesteuerte Taschenaufnähanlage
Computer-controlled pocket setting unit
Unité de couture pour la pose de poches, commandée par ordinateur






CNC

805

805 – Taschen aufnähen per Computer.

Die Tatsache, daß in unseren Produktionsstätten Computer, Roboter und hochmoderne Fertigungsstraßen eingesetzt werden, hat sicher etwas mit der Entwicklung der computergesteuerten Nähanlage 805 zu tun. Diese neue Fertigungseinheit zum Aufnähen von Taschen hat heute eine technische Perfektion erreicht, die sie in puncto Zuverlässigkeit, Vielseitigkeit und Nahtqualität zu einem Vorbild macht. Für uns ist die 805 ein entscheidender technischer Schritt, denn wir konnten hier das Erfahrungspotential vieler Jahre bündeln.

Der Aufbau der Nähanlage folgt in konsequenter Weise den Prinzipien der modularen Konstruktion: Steuerungseinheit, Nähmaschine, Spanntisch und Stapler sind in sich vollständig montierbare, prüfbare und austauschbare Module.

Alle 3 Achsen der Maschine (X-Achse/Y-Achse/Nähachse) werden von bewährten Gleichstrommotoren angetrieben. Zu jedem Zeitpunkt werden Lage und Geschwindigkeit der einzelnen Achsen erfaßt und durch die Mikroprozessorsteuerung verarbeitet.

Das Bedien-Terminal, der grafikfähige Bildschirm und das Kommandopult sind sichtgünstig und ergonomisch korrekt angeordnet.

Im Speicher des Computers können 40 Taschenprogramme gleichzeitig verfügbar gehalten werden (interne Speicherung). Zur Datensicherung und zur externen Speicherung ist ein 3.5"-Diskettenlaufwerk verfügbar. Auf der 3.5"-Diskette können ca. 500 Taschenformen gespeichert werden.

Der neue Taschenaufnäher 805 ist in höchstem Maße

- formflexibel –, weil die Nähanlage in ca. 1 – 2 Minuten von einer Taschenform auf eine andere Taschenform ohne Werkzeuge umgerüstet werden kann und nach dieser kurzen Umrüstzeit ohne Feinjustierungen wieder nähbereit ist.
- materialflexibel –, weil durch die neue Umbugtechnik mit Vakuum-Unterstützung jedes gängige Material unter höchsten Qualitätsanforderungen verarbeitet werden kann.
- anwendungsflexibel –, weil der Kunde seine Umbugsätze und CNC-Programme unabhängig vom Herstellerwerk selbst anfertigt.

Die CNC-Steuerung basiert auf modernsten Konzeptionen. Sie ist datenmäßig mit anderen Leitrechnern vernetzbar (CIM-Fähigkeit) und damit auch den Anforderungen der Zukunft gewachsen.

Um dem Anwender die Bedienung der Maschine zu erleichtern, wurde auf dem Bildschirm eine sogenannte Bedienoberfläche in Form von Bildschirmmasken geschaffen, die die Interaktion mit der Maschine, die Programmierung von neuen Taschen, die Auswahl vorhandener Programme, wie auch die Störungsdiagnose wesentlich erleichtert. Die Kommunikation via Bildschirm erfolgt in verschiedenen Sprachen.

Erstmalig hat unser Kunde die Möglichkeit, mit der Taschenaufnähanlage 805 auf Modeentwicklungen völlig autonom und in kürzester Zeit zu reagieren.

805 – computer-controlled pocket setting.

The fact that our factories are using computers, robots and state-of-the-art production lines has most certainly influenced the development of the computer-controlled 805 sewing unit. This new production unit for setting pockets has now reached a level of technical perfection which makes it a model for reliability, versatility and seam quality. To us, the 805 means a decisive step forward in technology since it contains our concentrated knowledge gained from many years of experience.

The entire sewing unit is designed according to modular construction principles: control unit, sewing machine, clamping table and stacker can be mounted, checked and exchanged separately as modules.

All three axes of the machine (X-axis/Y axis/sewing axis) are driven by service-proven DC motors. At any time, position and speed of the individual axes are recorded and processed by the microprocessor.

The operating terminal, the screen with graphics capability and the keyboard are positioned user-friendly and ergonomically correct.

In the computer memory 40 pocket programmes are available at the same time (RAM). For data-saving and external storing, the unit has a 3.5" floppy disc drive. On the 3.5" floppy disc you can store approx. 500 different pocket programmes.

The new pocket setter 805 offers highest

- shape flexibility – because the sewing unit can be converted from one pocket shape to another without tools in less than 2 minutes and without any further precise adjustments it is ready to continue sewing.
- material flexibility – because due to the new creasing technique supported by the vaccum unit any current material can be sewn still meeting highest quality standards.
- application flexibility – because the customers can make their own creasing sets and CNC-programmes independently of the sewing machine manufacturer.

The CNC-control is based on state-of-the-art concepts. It can be linked up with other main computers (CIM-capability) and therefore it will be able to meet the requirements of the future.

The operator can easily learn how to work with the sewing unit. The programme is screen-orientated with prompters and menu-driven, i.e. self-explanatory. Interacting with the machine, programming new pocket shapes, chosing different programmes and diagnosing errors becomes extremely simple. Communicating via screen is possible in different languages.

With the 805 pocket setting unit our customers can – for the first time – react instantly and autonomously to fashion trends.

805 – la pose de poches commandée par ordinateur.

L'introduction dans nos ateliers de production d'ordinateurs, de robots et des chaînes de fabrication très modernes, a certainement influencé la conception de l'unité de couture 805, commandée par ordinateur. Cette nouvelle unité de production pour la pose de poches présente sans doute un modèle de perfection technique quant à la fiabilité, la polyvalence et la qualité de la couture. Pour nous, la 805 signifie un pas technique crucial, car c'est l'aboutissement de longues années d'expériences.

L'unité de couture se base sur une construction modulaire: L'unité de commande, la machine à coudre, la table d'alimentation et l'empileur représentent des modules qui peuvent être montés, contrôlés et interchangés.

Les trois axes de l'unité (axe des x, axe des y et axe de couture) sont actionnés par des moteurs à courant continu ayant fait leurs preuves. A tout moment, la position et la vitesse de chaque axe sont déterminées et traitées par le microprocesseur.

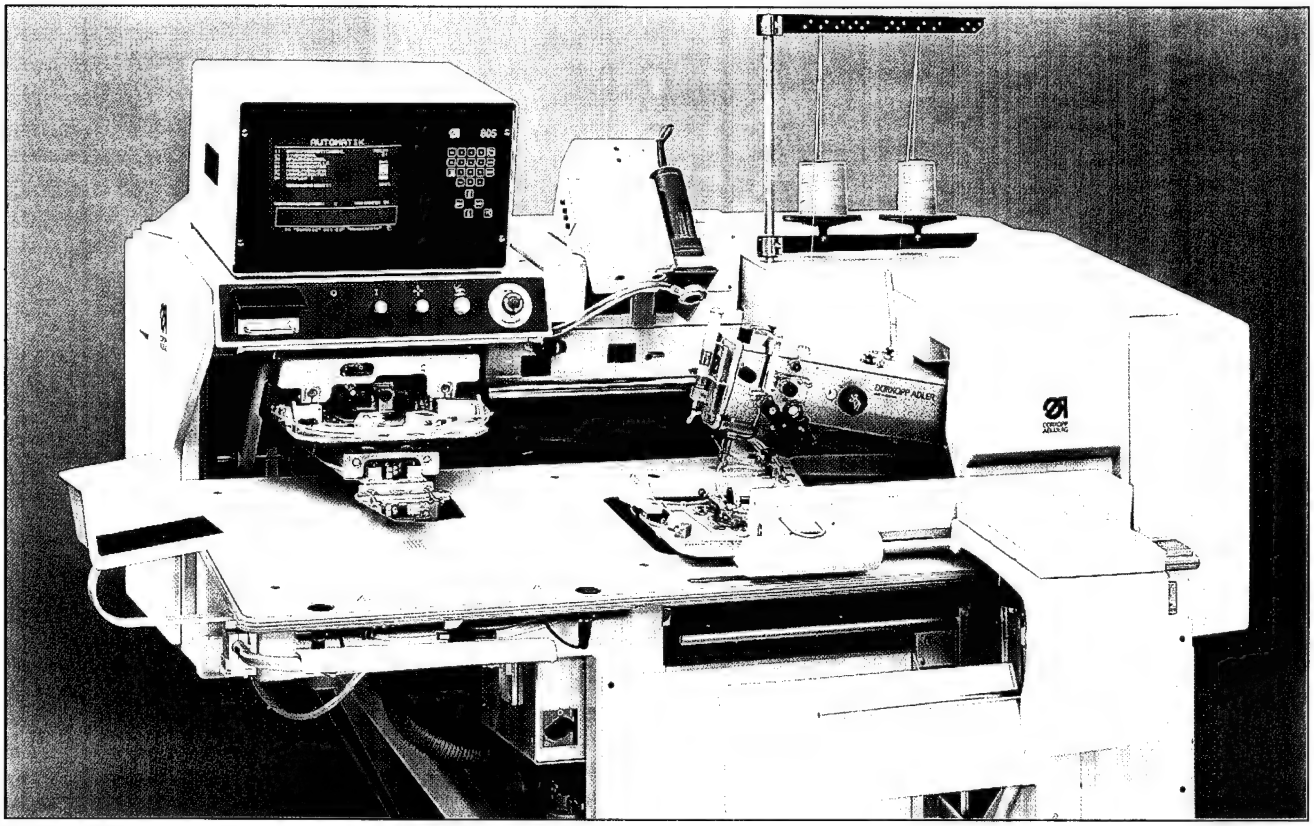
Le terminal employé, l'écran de visualisation graphique et le pupitre de commande sont installés d'une manière ergonomique bien visible et à portée de la main.

La mémoire de l'ordinateur peut recevoir simultanément 40 programmes de poches (mémoire interne). Pour la protection des données et la mémorisation externe, une unité de disquettes 3,5" permet de mémoriser env. 500 formes de poches.

La nouvelle unité 805, pour la pose de poches, offre un très haut degré de

- flexibilité de formes – car l'unité peut être transformée en 2 minutes pour réaliser une autre forme de poche, sans ajustage de précision et est à nouveau prête à coudre.
- flexibilité de tissus – car la nouvelle technique de rempliage, assistée par aspiration, permet de traiter tous les genres de tissus courants, tout en respectant les plus hautes exigences de qualité.
- flexibilité d'emploi – car le client est en mesure de fabriquer lui-même des kits de rempliage et de réaliser des programmes NC.

La commande CNC s'appuie sur les conceptions les plus modernes. Sa compatibilité (capacité CIM) permet un échange



de données avec d'autres ordinateurs et notes. Ainsi, la commande CNC est bien orientée vers le futur.

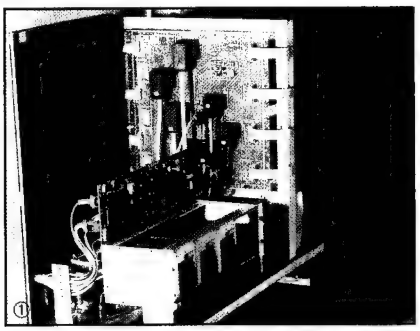
L'interface pour le maniement de l'unité, l'écran renferme, entre autres, une zone de commande. Ce système permet l'interaction avec la machine, la programmation de nouvelles poches, la sélection des programmes disponibles et une vaste liste de perturbations. La communication par écran a lieu en plusieurs langues.

En choisissant l'unité de couture 805, notre client est en mesure, pour la première fois, de répondre immédiatement et de manière particulièrement autonome aux tendances de la mode.

Details der Nähanlage 805:

Features of the 805 sewing unit:

Les détails de l'unité de couture 805:



1: Das Herz der Nähanlage 805. Die auf modernste Konzeption basierende CNC-Steuerung ist datenmäßig mit anderen Rechnern (Leitrechnern) vernetzbar (CIM-Fähigkeit) und damit auch den Anforderungen der Zukunft gewachsen.

Die Anordnung auf einem speziellen Einschubwagen gewährleistet optimale Zugänglichkeit zu allen Komponenten und damit auch eine hervorragende Service-Möglichkeit.

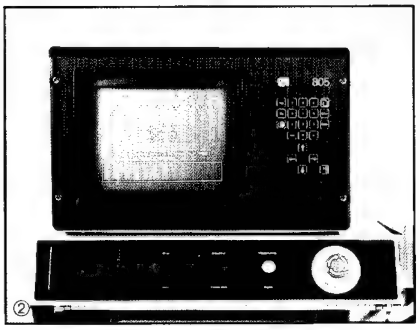
2: Vom Bedien-Terminal mit grafikfähigem Bildschirm und dem Kommandopult werden alle erforderlichen Befehle an die Steuerung weitergegeben. Es wurde in optimaler Weise sicht- und griffgünstig angebracht.

3 + 4: Zur leichteren Bedienung der 805 wurde auf dem Bildschirm eine sogenannte "Bedienoberfläche" geschaffen, die den Dialog mit der Maschine, die Programmierung neuer Taschen, sowie die Auswahl vorhandener Programme wesentlich vereinfacht.

5: 40 Taschenprogramme können im Speicher der Steuerung gleichzeitig verfügbar gehalten werden. Das als Zusatzausstattung erhältliche 3.5' Diskettenlaufwerk ermöglicht die Speicherung von ca. 500 Taschenprogrammen je Diskette. Beim Betrieb mehrerer Nähanlagen eines Typs genügt lediglich ein Diskettenlaufwerk.

6: Das Funktionsprinzip der Nähanlage 805:

Nähkopf und Umbugstation sind stationär angeordnet. Zwischen beiden arbeitet eine bewegliche Transferplatte, die für den Transport und für die Durchführung der programmierten Bewegung des Nähgutes unter der Maschine zuständig ist.



1: This is the brain of the 805 sewing unit. Being based on state-of-the-art concepts this CNC-control can be linked up with other main computers (CIM-capability) and therefore, it will be able to meet the requirements of the future.

The control is mounted on a carriage and thus allows for optimum accessibility of all components offering excellent service possibilities.

2: The operating terminal with a screen with graphics capability and the control panel are positioned very user friendly and transmit all necessary commands to the micro-processor control.

3 + 4: This programme is screen-orientated and menu-driven. Therefore, operating the 805 becomes much simpler. Communicating with the machine, programming new pocket shapes and picking pocket programmes is facilitated.

5: 40 pocket programmes are accessible simultaneously in the control's memory. The optional 3.5' floppy disc drive allows for memorizing about another 500 pocket programmes per disc. When using several 805 sewing units only one floppy disc drive is necessary.

6: Operating principles of the 805 sewing unit:

Sewing head and creasing station are stationary. A transfer device carries the material from the creasing station into the sewing area and sews the programmed seam contour.

1: Le coeur de l'unité de couture 805. La commande CNC qui se base sur des conceptions les plus modernes et qui est compatible avec d'autres ordinateurs pilotes (capacité CIM) est bien orientée vers le futur.

L'agencement sur un dispositif mobile assure un acces optimum à tous les composants et permet ainsi un entretien encore plus facile.

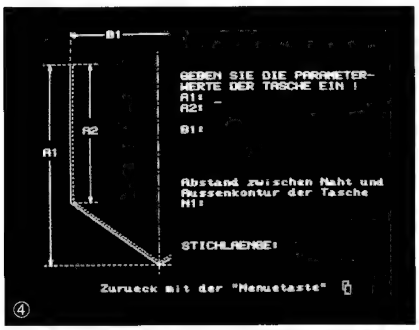
2: Voici le terminal d'emploi en combinaison avec l'écran de visualisation graphique et le pupitre de commande d'où sont transmis tous les ordres nécessaires. Il est installé d'une manière bien visible et à portée de la main.

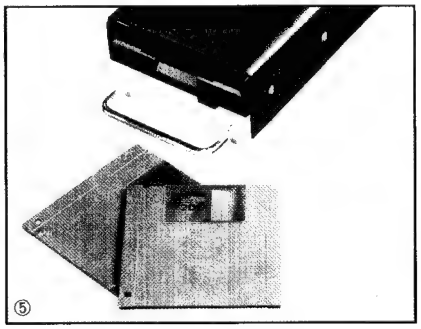
3 + 4: Pour simplifier le maniement de la 805 l'écran renferme une "zone de commande" qui facilite considérablement le dialogue avec la machine, la programmation de nouvelles poches et la sélection des programmes disponibles.

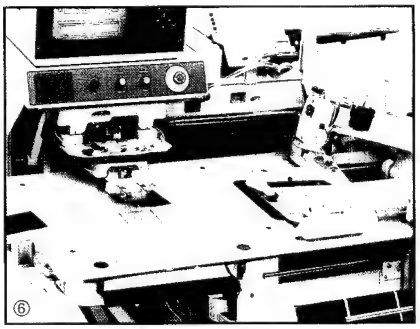
5: La mémoire de l'ordinateur peut recevoir simultanément 40 programmes de poches. L'unité de disquettes 3,5' (équipement supplémentaire) permet en outre de recevoir env. 500 programmes de poches sur chaque disquette. En employant simultanément plusieurs unités de couture du même type, une seule unité de disquettes est nécessaire.

6: Le principe de fonctionnement de l'unité de couture 805:

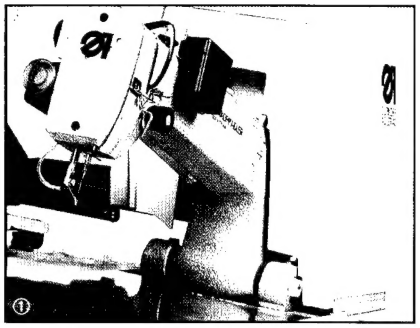
La tête de couture et la station de rempliage sont installées d'une manière fixe. Entre les deux travaille un dispositif de transfert mobile qui s'occupe du transport et de la réalisation du mouvement programmé du tissu sous la machine.







Details der Nähanlage 805:



① Der Doppelsteppstich-Nähkopf der 805-121101 für die Hemden- und Blusenfertigung. Ausgestattet mit kleinem Horizontalgreifer, Fadenabschneider und pneumatischer Nadelkühlung. Eine elektronische Nadelfadenüberwachung und ein programmierbarer Greiferfadenstichzähler sorgen bei Fadenbruch oder leerer Spule für sofortigen Stop der Nähanlage.

② Die 805-111101 hat einen schweren Doppelsteppstich-Nähkopf zum Verarbeiten von Jeans, Berufsbekleidung und Sportbekleidung. Ausgestattet mit großem Vertikalgreifer, elektronischer Nadelfadenüberwachung, Restfadenwächter für den Greiferfaden, pneumatischer Nadelkühlung und einem Spezial-Getriebe zum Nähen von Zickzack-Riegeln.

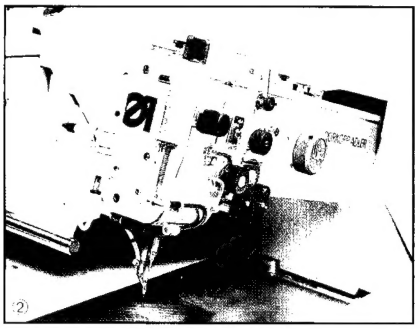
③ Zum besseren Übernähen von Paspeln, Biesen und ähnlichen Dickstellen im Material besitzen die Nähköpfe der 805 eine programmierbare Hublagenverstellung, durch die der Nähfußhub programmgesteuert dem jeweiligen Nähgutstärkenniveau angepaßt werden kann.

④ Umbugsätze, Transferplatten und CNC-Programme können vom Kunden selbst hergestellt werden. Eine spezielle Fräseinrichtung zur Bearbeitung der Teilebausätze ist als Zusatzausstattung erhältlich.

⑤ Die Umrüstung auf eine andere Taschenform kann durch die pneumatische Schnellwechselspannung in sehr kurzer Zeit erfolgen. Die Zuordnung von Transferplatte und Programm wird durch ein Reflexfolienmuster an der Transferplatte überwacht.

⑥ Auswerfereinheit und Stapler der Nähanlage 805. Zur Optimierung des Abstapelergebnisses sind beide mit wenigen Handgriffen in Querrichtung zu verstellen.

Features of the 805 sewing unit:



① The lockstitch sewing head of the 805-121101 for the manufacture of shirts and blouses. Featuring a small horizontal hook, thread trimmer and pneumatic needle cooler. An electronic needle thread monitor and programmable bobbin thread stitch counter immediatly interrupt the sewing cycle in the case of thread breakage or empty bobbin.

② The 805-111101 has a heavy-duty lockstitch sewing head for sewing jeans, work wear and sportswear. Featuring a large vertical hook, electronic needle thread monitor, bobbin thread monitor, pneumatic needle cooler and special gear for sewing zigzag tacks.

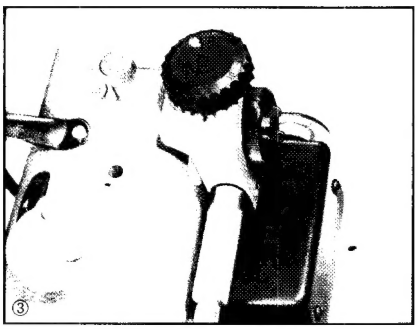
③ For easily sewing over piping, pin tucks and other thick spots in the material the sewing head of the 805 has a programmable foot stroke adjustment. It is controlled by the programme and adjusts the sewing foot stroke to the respective material thickness.

④ Creasing sets, transfer devices and CNC-programmes can be made by the customers themselves. A special milling device for working on the kits is available as optional equipment.

⑤ Changing to a new pocket shape can be carried out quickly due to the pneumatic fast exchange clamp. On the top left of the transfer device, reflecting foil is arranged in a certain pattern for easy identification of the programme.

⑥ Ejecter unit and stacker of the 805 sewing unit. To optimize stacking, both devices can quickly and easily be moved to the left or right.

Les détails de l'unité de couture 805:



① La tête de machine à point noué de la 805-121101 pour la fabrication de chemises et chemisiers. Elle est équipée d'un petit crochet horizontal, d'un coupe-fil et d'un refroidissement d'aiguille pneumatique. Un contrôle électronique du fil d'aiguille et un compteur de points programmable pour le fil de crochet interrompent le fonctionnement de l'unité en cas de casse de fil ou canette vide.

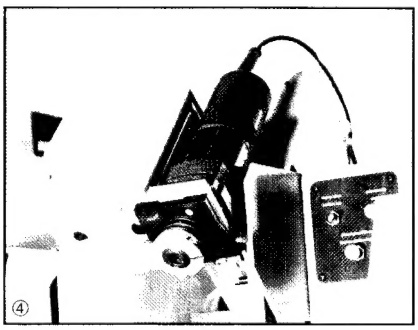
② La 805-111101 travaille avec une tête de machine à point noué pour coutures sur jeans, vêtement de travail et de sport. Elle est dotée d'un grand crochet vertical, d'un contrôle électronique du fil d'aiguille, d'une surveillance de la quantité du fil de crochet, d'un refroidissement d'aiguille et d'un engrenage spécial pour la réalisation d'arrêts zig-zag.

③ Pour faciliter le passage des surépaisseurs, la tête de couture possède une levée programmable. Commandée par programme, l'adaptation aux différentes épaisseurs de tissu, l'élévation du pied de couture s'effectue automatiquement.

④ Le client est en mesure lui-même de réaliser des kits de remplage, des dispositifs de transfert et des programmes CNC. Un dispositif de fraisage pour la fabrication de jeux de pièces est proposé comme équipement supplémentaire.

⑤ La transformation de l'unité pour une autre forme de poche est rapidement réalisée au moyen d'un dispositif pour le changement de formes. L'agencement du dispositif de transfert et du programme est surveillé par des feuilles réflectives situées sur les dispositifs de transfert.

⑥ Le dispositif à rouleaux pour retirer les pièces et l'empileur de l'unité de couture 805. En peu de gestes, leur position peut être modifiée en position transversale.



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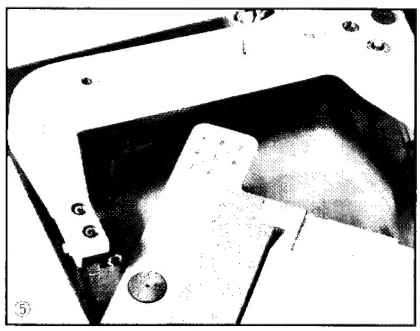

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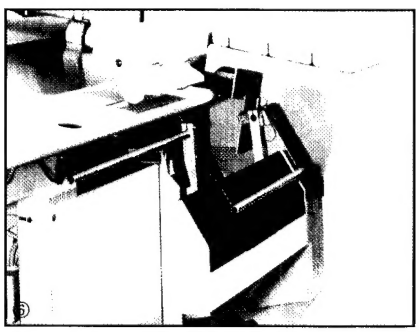
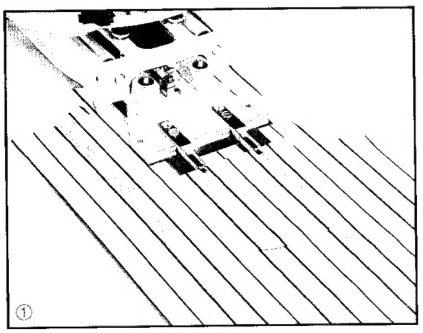


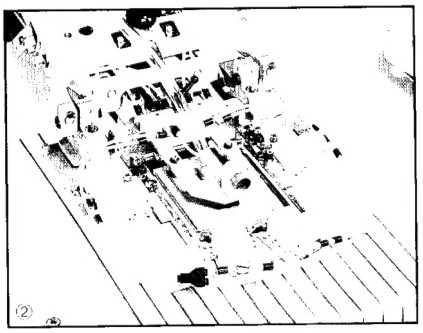
⑥

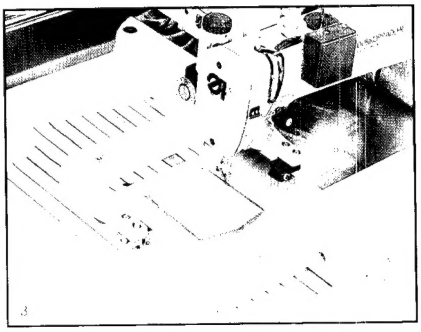
Der Arbeitsablauf an der Nähanlage 805:

Operating cycle on the 805 sewing unit:

Le déroulement de travail sur l'unité de couture 805:







① Der Taschenzuschnitt wird unter die Klemmstücke des Mittelschieberbleches der Umbugstation gelegt und danach der Grundteil-Zuschnitt auf der Tischplatte positioniert.
Nach dem Ausrichten, welches durch Absenken der Tasche auf das Grundmaterial überprüft werden kann, wird Vakuum eingeschaltet, das den Grundteil-Zuschnitt auf der Tischplatte in der positionierten Lage festhält.

② Danach wird der Umbug-Vorgang durch Auslösen eines Handtasters auf der Arbeitsplatte ausgelöst.

③ Nach dem Umbuggen des Zuschnittes übernimmt die Transferplatte die fertig gefaltete Tasche und den Grundteil-Zuschnitt, transportiert beide zur Nähstation und vollzieht dort die programmierte Bahnbewegung.

④ Das fertig genähte Teil wird vom Stapler automatisch übernommen und das nächste während der Nähphase eingelegte Teil wird von der Transferplatte übernommen.

⑤ Sollen Etiketten, Embleme oder Ziernähte auf den Taschenzuschnitt genäht werden, kann dies im Wechsel- oder Einzelmodus geschehen.
Beim Wechselmodus (W) geschieht dies mit einer Transferplatte im Wechsel.
Im Einzelmodus (E) wird gearbeitet, wenn auf der Transferplatte kein ausreichender Platz für den Zusatz vorhanden ist. Es wird dann zunächst mit einer Transferplatte der Zusatz und dann mit einer zweiten die Tasche aufgenäht.

⑥ Ziernähte, die innerhalb einer Doppelnaht liegen, können frei programmiert und editiert werden. Das Nähen erfolgt nach dem Taschenaufnähen, im direkten Anschluß an die Nahtendenverriegelung.

1. The cut pocket is positioned under the clamping pieces of the centre slide plate of the creasing station. The underlying lower piece (eg shirt front) is positioned on the work-table.
After precise positioning which can be checked by means of lowering the pocket on to the base material, the vacuum unit is switched on which holds the lower piece in position.

2. By means of a push-button on the work-table the creasing [illegible] is actuated.

3. After the creasing the transfer device takes over the creased pocket and the shirt front and transfers the pieces to the sewing station. The machine then sews the programmed seam [illegible].

4. The finished part is automatically stacked and the next piece already positioned during the sewing cycle is taken over by the transfer device.

5. Labels, emblems or decorative seams may be sewn on the cut pocket in alternate or single mode. In the case of alternate mode (W) the two sewing operations are performed alternately using the same transfer device. The single mode (E) is applied when the transfer device doesn't offer sufficient space for eg a label. In this case, first the label is attached with one transfer device, and then the pocket is set with a second transfer device.

6. Decorative seams that are located between a double seam can be freely programmed and memorized. They are sewn when the pocket has been set, immediately after the seam has been backtacked.

Positionner la découpe de poche sous les pièces de la tôle de glissement de la station de repli/apprêt et positionner la découpe de la pièce sur la table.
Après avoir positionné la poche sur la pièce, contrôler le positionnement et actionner le vacuum pour fixer la pièce.

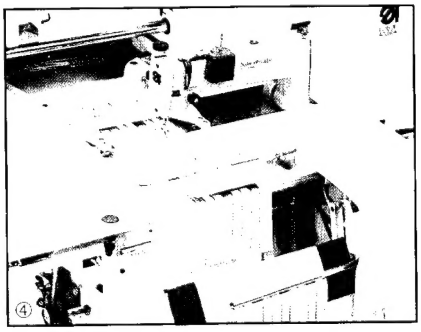
Déclencher le procédé de repli/apprêt à l'aide d'un bouton-poussoir placé sur la table de travail.

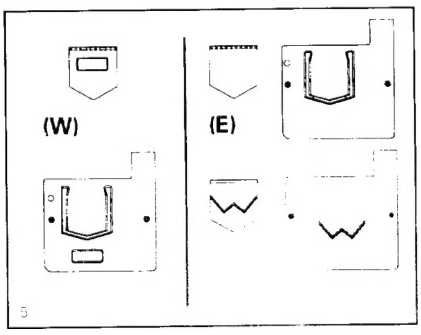
Après le repli/apprêt, le dispositif de transfert entraîne la poche repliée et la pièce vers la zone de couture et réalise la trace de couture programmée.

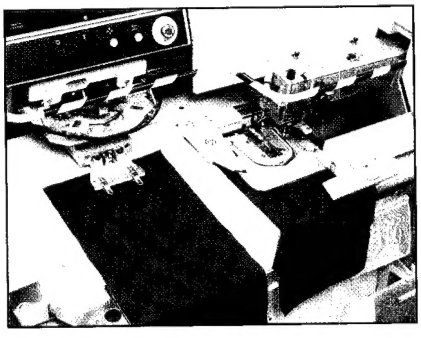
La pièce terminée est empilée automatiquement. Simultanément, le dispositif de transfert prend la pièce suivante, positionnée pendant le processus de couture.

Le mode alternatif ou le mode individuel sont prévus pour poser des étiquettes et des emblèmes ou réaliser des coutures d'ornement. En cas de mode alternatif (W), on ne travaille qu'avec une plaque de transfert en réalisant les deux opérations, l'une après l'autre. Le mode individuel (E) est à choisir si une seule plaque de transfert n'offre pas assez de place pour réaliser la deuxième opération. D'abord, on utilise une plaque de transfert pour la première opération (pose de l'étiquette p.ex.) et ensuite une autre pour poser la poche.

Les coutures d'ornement se trouvant à l'intérieur d'une couture double sont programmées librement et ensuite mémorisées. Elles sont réalisées directement après la pose de la poche à la suite des points d'arrêt.







Taschen- und Riegelgrundformen:

Mit der Nähanlage 805 können die abgebildeten Taschenformen in Einfach- oder Doppelnahtausführung verarbeitet werden.
Bei Taschenformen mit Einfachnaht können zusätzlich Bleistifttaschen mit genäht werden.
Bei Taschen mit Doppelnaht kann innerhalb der Doppelnaht eine Ziernaht genäht werden.
Embleme, Etiketten und Ziernähte auf dem Taschenzuschnitt können bei beiden Nahtausführungen mitgenäht werden.

Die Taschendimensionen liegen innerhalb der folgenden Maße:
max. Breite = 200 mm
max. Tiefe = 220 mm

Basic pocket and tack types:

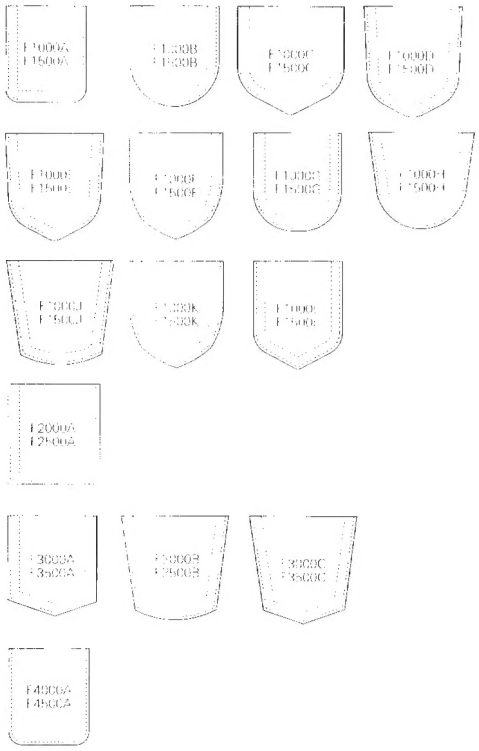
With the 805 sewing unit the pocket styles shown below can be sewn either as single or double seam version.
Pocket types with single seam may be sewn with pencil pockets.
On pockets with double seam a decorative seam can be sewn between the double seams.
Both seam versions allow simultaneously sewing emblems, labels and decorative seams on the cut pocket.

Pocket measurements are as follows:
Max. width = 220 mm
Max. depth = 220 mm

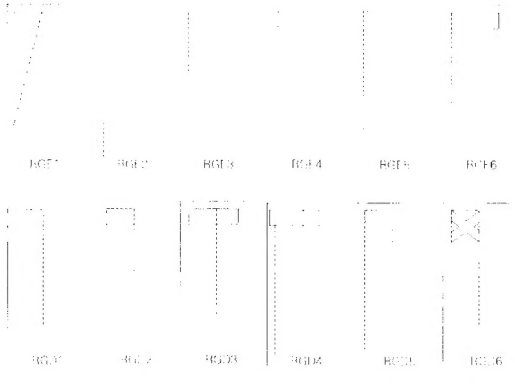
Formes de base de poches et d'arrêts.

L'unité de couture 805 permet de réaliser les formes de poches représentées, en couture simple ou en couture double.
Lors de la réalisation de formes de poches avec couture simple, il est possible de réaliser en plus des poches portecrayon.
Lors de la réalisation de formes de poches avec couture double, il est possible de réaliser une couture d'ornement à l'intérieur de la couture double.
Les deux versions de couture permettent de réaliser des emblèmes et des coutures d'ornement sur les découpes de poches ainsi que d'y poser des étiquettes.

Les dimensions de poches se situent entre les mesures suivantes:
Largeur max. = 200 mm
Profondeur max. = 220 mm



Taschenformen mit Einfachnaht:	Pocket types with single seam:	Poches avec couture simple
Grundform 1000, rund	Basic type 1000, round	Forme de base 1000, arrondie
Grundform 2000, 2-eckig	Basic type 2000, 2 corners	Forme de base 2000, 2 angles
Grundform 3000, 3-eckig	Basic type 3000, 3 corners	Forme de base 3000, 3 angles
Grundform 4000, 4-eckig	Basic type 4000, 4 corners	Forme de base 4000, 4 angles
mit Doppelnaht:	**Pocket types with double seam:**	**Poches avec couture double:**
Grundform 1500, rund	Basic type 1500, round	Forme de base 1500, arrondie
Grundform 2500, 2-eckig	Basic type 2500, 2 corners	Forme de base 2500, 2 angles
Grundform 3500, 3-eckig	Basic type 3500, 3 corners	Forme de base 3500, 3 angles
Grundform 4500, 4-eckig	Basic type 4500, 4 corners	Forme de base 4500, 4 angles



Riegelformen:	Tack types:	Formes d'arrêts:
RGE1 = Dreiecksriegel	RGE1 = Triangular tack	RGE1 = Arrêt triangulaire
RGE2 = U-Riegel	RGE2 = U-tack	RGE2 = Arrêt en U
RGE3 = L-Riegel	RGE3 = L-tack	RGE3 = Arrêt en L
RGE4 = Kasten Riegel	RGE4 = Box tack	RGE4 = Arrêt rectangulaire
RGE5 = Rückwärts-riegel	RGE5 = Backtack	RGE5 = Arrêt droit
RGE6 = Zickzack-Riegel	RGE6 = Zigzag tack	RGE6 = Arrêt zigzag
RGD1 = U-Riegel	RGD1 = U tack	RGD1 = Arrêt en U
RGD2 = Zickzack-Riegel	RGD2 = Zigzag tack	RGD2 = Arrêt zigzag
RGD3 = Zickzack-Riegel	RGD3 = Zigzag tack	RGD3 = Arrêt zigzag
RGD4 = Zickzack-Riegel	RGD4 = Zigzag tack	RGD4 = Arrêt zigzag
RGD5 = Diagonal-Zickzack-Riege	RGD5 = Diagonal zigzag tack	RGD5 = Arrêt zigzag diagonal
RGD6 = Kreuz-Zickzack-		RGD6 = Arrêt zigzag en croix

RGE1 - RGE6, RGD1 - RGD6 = **805-111101**/ RGE1 - RGE6, RGD1 f= **805-121101**

Die technischen Daten der Nähanlage 805: / Technical data of the 805 sewing unit: / Les données techniques de l'unité de couture 805:

	mm	Stiche/min Stitches/min Points/min max.	ab Werk from factory à partir de l'usine	Nähgut Material Matière			Geradstich-Riegel Straight stitch Arrêt droit	Zickzack-Riegel Zig-zag tack Arrêt zigzag
-111101	3,5	3500	3500	MS, S		●	●	●
-121101	3,0	4000	4000	L, LM	●		●	

	(mm)	System	Nm	max. Synthetik Synthetic Synthétique	Baumwolle Cotton Coton	NL	bar	Abmessungen Dimensions Dimensions (mm) Länge Lenght Long.	Breite Width Largeur	Höhe Height Haut.	kg n. wt.
-111101	220x220	134	80-140	50/2	16/4	28	6	1880	1720	1750	760
-121101	200x220	134	70-100	50/2	30/3	28	6	1880	1720	1750	760

L = Leichtes Nähgut
LM = Leichtes bis mittelschweres Nähgut
MS = Mittelschweres bis schweres Nähgut
S = Schweres Nähgut

L – Lightweight material
LM – Light to medium weight material
MS – Medium to heavyweight material
S – Heavy weight material

– Tissu léger
– Tissu léger à moyen
– Tissu moyen à lourd
– Tissu lourd

Näheinrichtungen: / Sewing equipment: / Equipement de couture:

Einsatzgebiet Application Emploi	Nähgut Material Tissu	Unterklasse Subclass Sous-classe	E-Nr.
Taschen aufnähen Setting pockets Pour la pose de poches	Mittelschwere bis schwere Wäschestoffe Medium to heavyweight shirt/blouse fabric Tissu chemise/chemisier moyen à lourd	-111101	E1
	Leichte bis mittelschwere Sport- u. Berufsbekl., Sakkostoffe Leight to medium weight sports and work wear, jacket cloth Tissu léger à moyen pour vêtement de sport et de travail, tissu pour vestons		E2
	Cord und Frottee Cordurry and terry Cord et tissu éponge		E3
	Schwere Sport- u. Berufsbekleidung Heavyweight sports and work wear Tissu lourd pour vêtement de sport et de travail		E4
	Schwerer Denim und Cord Heavyweight denim and cordurry Denim et cord lourds		E5
	Leichte Wäschestoffe Leightweight shirt/ blouse fabric Tissu chemise/ chemisier léger	-121101	E6
	Mittelschwere Wäschestoffe Medium weight shirt/ blouse fabric Tissu chemise/ chemisier moyen		E7
	Leichte bis mittelschwere Berufsbekleidung Leight to medium weight work wear Tissu léger à moyen pour vêtement de travail		E8

Eine Nadel	Doppelstepp-stich (301)	Horizontal-greifer, klein	Vertikalgreifer, groß	Fadenab-schneider	Nadelfaden-wächter	Überwurf-stapler	CNC CNC-Bahn-steuerung	Pneu. Nadel-kühlung
Single needle	Lockstitch	Horizontal hook, small	Vertikal hook, large	Thread cutter	Needle thread monotor	Flip stacker	CNC-contour control	Pneum. needle cooling
Une aiguille	Point noué	Crochet horizontal, petit	Crochet vertical, grand	Coupe-fil sous la plaque à aiguille	Veilleuse fil d' aiguille	Extracteur	Commande CNC	Refroidissement d' aiguille pneumatique

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